ELSEVIER Original Article

Needlescopic Totally Extraperitoneal Hernioplasty for Unilateral Inguinal Hernia in Adult Patients

Wong-Hoi She, Oswens Siu-Hung Lo, Joe King-Man Fan, Jensen Tung-Chung Poon and Wai-Lun Law,
Division of Colorectal Surgery, Department of Surgery, University of Hong Kong, Queen Mary Hospital, Hong Kong SAR.

OBJECTIVE: Totally extraperitoneal (TEP) inguinal hernioplasty for inguinal hernia is associated with less postoperative pain, shorter hospital stays, less chronic pain, and increased patient satisfaction when compared with the open Lichtenstein approach.. However, only few studies to date have compared conventional with needlescopic TEP hernioplasty for treating unilateral inguinal hernias in adult patients. We report our prospective study that compared the postoperative outcomes of these two approaches over a 2-year period.

METHODS: From July 2007 to June 2009, a total of 32 patients underwent attempted unilateral needlescopic TEP hernioplasty. All data were prospectively collected and analysed, including demographic features, types of hernia, and postoperative outcome. The results were compared with those of an age-matched cohort of 32 patients who underwent conventional TEP hernioplasty in the same period.

RESULTS: Needlescopic TEP hernioplasty was successfully performed in 24 patients. The other eight procedures were completed with conventional TEP approaches after changing one or two 5-mm ports. The most common hernia type was Nyhus type III (38/64, 59.3%). There was no significant difference in the mean operative time, hospital stay, and postoperative pain scores between the needlescopic and conventional approaches. There was no major complication detected on the first visit, except seroma formation (9 patients in the needlescopic group and 11 in the conventional group), all of which was resolved with conservative management. No recurrence of hernia was noted in either group during the mean follow-up period of 88.0 weeks.

CONCLUSION: Needlescopic TEP hernioplasty was a feasible technique in selected patients for inguinal hernia repair. Postoperative recovery following both approaches was similar. However, because this was a small cohort study, larger prospective, randomized controlled trials are required to establish the long-term benefit, safety and complications of needlescopic surgery. [*Asian J Surg* 2011;34(1):23–27]

Key Words: inguinal hernia, needlescopic surgery, totally extraperitoneal hernioplasty

Introduction

Since the introduction of totally extraperitoneal (TEP) inguinal hernioplasty for treatment of groin hernia, people have advocated its use in bilateral and recurrent hernias. The approach has also been shown to be superior to the open Lichtenstein approach for unilateral primary inguinal hernia in terms of less postoperative pain, a faster return to work, and a lower incidence of chronic groin pain.[1–4] Although there have been promising results when using needlescopic instruments for laparoscopic hernioplasty in paediatric patients,[5–7] the results might

Address correspondence and reprint requests to Professor Wai-Lun Law, Division of Colorectal Surgery, Department of Surgery, University of Hong Kong Medical Centre, Queen Mary Hospital, Pokfulam Road, Hong Kong SAR.
E-mail: lawwl@hkucc.hku.hk • Received: Aug 5, 2010 • Revised: Nov 6, 2010 • Accepted: Jan 31, 2011

differ in terms of underlying pathology and surgical procedure in adult patients. Only a few studies to date have compared conventional with needlescopic TEP techniques for treating inguinal hernias in adult patients.[8–10] The objective of the current prospective study was to compare the postoperative outcomes of these two approaches.

Materials and methods

Patients

Since July 2007, the laparoscopic specialists in our team (OL, JP and JF) attempted the technique of needlescopic TEP hernioplasty for unilateral inguinal hernia repair. Patients with obesity, inguinoscrotal hernia, irreducible hernia, or coagulopathy and not fit for general anaesthesia were excluded. All patients were reassessed by an anaesthetist and surgeon in the preoperative assessment clinic before the operation. If the patients were eligible for an ambulatory procedure, they were admitted on the morning of the operation. Between July 2007 and June 2009, 32 patients underwent attempted unilateral needlescopic TEP hernioplasty at our institution, and 20 patients had ambulatory procedures. A case-matched cohort of 32 patients with unilateral conventional TEP hernioplasty during the same period was selected for comparison. Types of hernia were determined intraoperatively according to the Nyhus classification.[11]

Surgical technique

No preoperative bowel preparation was required. No routine urinary catheterization was needed unless the patient had recurrent hernia. One dose of amoxicillin clavulanate (Augmentin; 1.2 g) was given for antibiotic prophylaxis before anaesthesia was induced. The operative techniques for conventional TEP hernioplasty have been described elsewhere.[12] For needlescopic TEP hernioplasty, a subumbilical 10-mm trocar was placed into the preperitoneal space using an open cut-down technique that allowed mesh insertion. A 30° telescope was used. The extraperitoneal space was bluntly dissected with the telescope. Two 3.9-mm trocars (Karl Storz, GmbH & Co. KG, Tuttlingen, Germany) were inserted at the lower midline under endoscopic vision: one approximately 8 cm from the pubis, and the other at 2–3 cm above the first port (Figure 1). The rest of the procedure was performed as for the conventional approach using scissor, dissecting and grasping forceps of size 3.5 mm and length 30 cm (Karl Storz, GmbH & Co. KG). After reduction of the hernia sac, parietalization of the spermatic cord was routinely performed for a length of approximately 4 cm. For large direct inguinal hernia, the attenuated transversalis fascia was inverted and ligated with a pre-tied suture loop. A lightweight polypropylene mesh of 10 cm × 15 cm was introduced to cover the whole myopectineal orifice. No stapling or glue

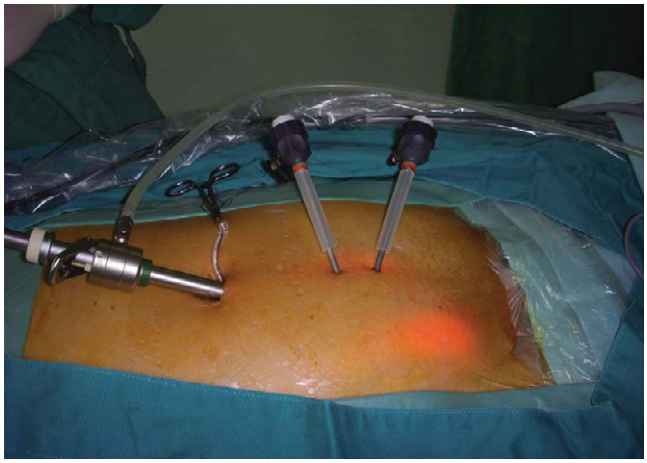

Figure 1. Placement of working ports and telescopic in needlescopic TEP hernioplasty.

Table 1. Demographic data and results

	Needlescopic ($n=32$)	Conventional ($n=32$)	p
Mean age (yr)	55.7	58.3	0.42
Sex (M:F)	29:3	31:1	0.30
Mean operative time (min)	76.1	85.4	0.19
Discharged < 24 hr (%)	62.5	62.5	1.00
Day 1 pain score	2.2	2.0	0.73
Day 3 pain score	1.1	0.83	0.57
Time to resume duty (d)	3.9	2.6	0.10
Postoperative seroma (%)	28.1	34.4	0.72

was used for mesh fixation. All skin incisions were infiltrated with 10 mL 0.5% bupivacaine before wound closure. Needlescopic port wounds were closed with adhesive Steri-Strip (3M; 3M Health Center, St Paul, MN, USA).

Postoperative assessment

Patients were allowed to resume normal diet and normal activities once they felt conscious immediately after the operation. Patients who underwent ambulatory TEP hernioplasty were discharged from our Day Surgery Unit on the same day after assessment by the anaesthetist and operating surgeon. All patients were prescribed oral analgesics (50 mg propoxyphene and 325 mg paracetamol) four times daily on the patient's request. All patients were instructed to complete a chart for documentation of pain scores using a visual analogue scale. Length of hospital stay referred to the total number of hours spent in hospital after the operation. Patients were reassessed postoperatively in the outpatient clinic after 2 weeks, 6 months, 1 year, and then annually. All complications were recorded and any clinical recurrence was documented.

Statistical analysis

All patients' demographic, operative and follow-up data were prospectively collected in our database. Statistical analysis was performed with the help of SPSS version 16 using appropriate tests including Student's *t* test and χ^2 test. A p value < 0.05 was considered to indicate statistical significance.

Results

A total of 64 patients were included in this cohort study. Thirty-two patients (31 male and 1 female) were in the conventional TEP hernioplasty group, and 32 (29 male and 3 female) were in the needlescopic TEP hernioplasty group. The mean age of the patients was 58.3 ± 12.2 years in the conventional group and 55.7 ± 13.7 years in the needlescopic group ($p = 0.42$). Hernia type was confirmed at the time of operation, and the most common type in both groups was type IIIB: 62.5% and 56.3% in the conventional and needlescopic groups, respectively (Table 2).

Table 2. Distribution of hernia types

Nyhus	Needlescopic ($n = 32$)	Conventional ($n = 32$)	
I	2 (6.25%)	1 (3.13%)	
II	6 (18.8%)	2 (6.25%)	
IIIA	5 (15.6%)	8 (25%)	$p = 0.54$
IIIB	18 (56.3%)	20 (62.5%)	
IV	1 (3.13%)	1 (3.13%)	

No patient required conversion to open hernia repair, but eight patients (25%) were converted to the conventional TEP approach. The 3-mm port was changed for a 5-mm port for application of pre-tied suture loop ligatures (6 patients for ligation of the hernia sac after distal transaction, and 1 for controlling accidental peritoneal perforation), and metal clips for haemostasis after incidental injury to the inferior epigastric artery in another patient.

There were no immediate complications. The mean operative time was 85.4 ± 32.7 minutes in the conventional group and 76.1 ± 22.6 minutes in the needlescopic group ($p = 0.19$). The mean duration of hospital stay was 19.0 ± 14.9 hours in the needlescopic group, and 20.4 ± 14.7 hours in the conventional group, although this difference was not significant ($p = 0.699$). Twenty patients in each group (62.5%) were able to be discharged within 24 hours after the operation.

The assessment of postoperative pain was interpreted with a visual analogue scale on day 1 and day 3 postoperatively. Thirty-eight (59.4%) patients completed the questionnaire (20 needlescopic and 18 conventional). On postoperative day 1, the mean pain score for the needlescopic and conventional groups was 2.2 ± 2.0 and 2.0 ± 1.5, respectively ($p = 0.728$). On postoperative day 3, the mean pain score was 1.1 ± 1.1 and 0.8 ± 1.2, respectively ($p = 0.565$).

On the first visit to the clinic, there were no major complications such as infection or haematoma formation, except for seroma (31.3%). Of these 20 patients,

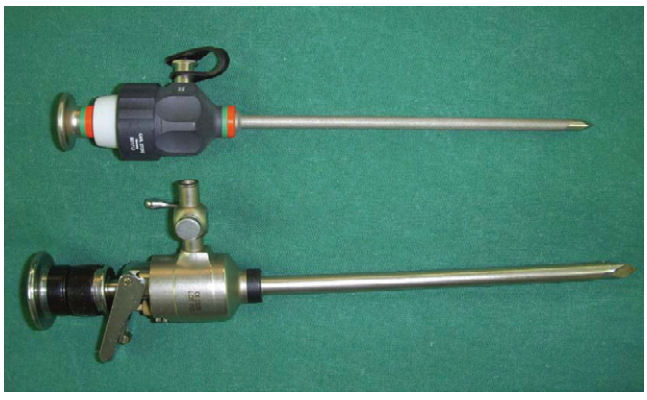

Figure 2. A 3-mm needlescopic (above) and 5-mm conventional working port (below).

11 (34.4%) in the conventional group and nine (28.1%) in the needlescopic group ($p = 0.39$) were found to have seroma on the first clinic visit. All the seromas had subsided on the subsequent follow-up visit, without any intervention. The mean time taken to resume normal activity was 2.6 ± 1.4 days in the conventional group and 3.9 ± 3.3 days in the needlescopic group. No recurrence was noted during the mean follow-up period of 88.0 ± 44.0 weeks.

Discussion

Since the introduction of laparoscopic inguinal hernia repair via the transabdominal preperitoneal or TEP approach in the early 1990s, the laparoscopic approach has clear advantages when compared with open mesh repair, including less acute and chronic postoperative pain, shorter convalescence, earlier return to work, and increased patient satisfaction.[13–15] The superior benefit of laparoscopic surgery is attributed in large part to the reduction of operative trauma; therefore, the next step is to reduce trauma further by using smaller instruments to achieve even better outcomes. These efforts are referred to as needlescopic, minilaparoscopic or microlaparoscopic surgery. Needlescopic surgery refers to operations performed with as many port sites, instruments or laparoscopes as possible < 3 mm in size, which allows placement of a 5-mm or 10–12-mm trocar in the umbilicus to control the blood supply, use of a linear stapler, or specimen extraction.[16] However, a more practical definition has been suggested by Yu et al,[17] in which all scopes should be ≤ 3 mm, with the exception of a 5–12-mm umbilical port. As no blood supply control or specimen extraction within the limited dissection space is required during TEP hernioplasty, using needlescopic instruments could be considered. The safety of needlescopic TEP hernia repair in adult patients has been demonstrated in previous studies.[8–10] The procedure itself results in a better cosmetic outcome,[8] fewer wound complications,[9] and a lower pain score upon coughing on the first day after surgery,[10] as compared with the conventional TEP approach.

The current study demonstrates that the needlescopic TEP approach for inguinal hernioplasty is a safe and feasible technique in selected adult patients. The patients recruited into this study, in both groups, were comparable in terms of their demographic data and type of hernia. Postoperative pain score, complications, recovery and outcome were compatible with previous studies.[8,10] We diagnosed seroma as a swelling over the groin region by clinical examination, without the use of diagnostic ultrasound. The incidence of postoperative seroma formation in this series was 31.3% (20/64) and was relatively high when compared with 7.2% in other conventional TEP studies.[18] In fact, the result could be an overestimation of the true incidence, because some of the patients might only have had oedema over the groin. All seroma subsided on subsequent follow-up visits, without any intervention. Seroma is a common morbidity and can develop over the groin region after TEP hernioplasty.[18] Most cases of seroma were asymptomatic and manifested as inconspicuous swellings over the groin region on clinical examination. The presence of seroma does not hamper patient recovery, and it usually presents transiently and resolves within an average of 2 months with expectant management. Lau et al[18] have shown that the clinical features associated with this complication include old age, large hernia defects, extension of the hernia into the scrotum, and the presence of a residual distal indirect sac. In our study, the total sample size in both groups was small, and more than half of our patients had an indirect inguinal hernia sac extending into the scrotum (i.e. Nyhus type IIIB), which could have contributed to the higher percentage of postoperative seroma formation.

There are some limitations in surgical dissection using needlescopic instruments. First, complete reduction of an indirect hernia sac might not be feasible after extensive dissection around the internal hernia orifice. Therefore, ligation of the hernia sac with a pre-tied suture loop ligature, followed by distal transaction is considered.[19] Therefore, six patients in the needlescopic group were "converted" to the conventional approach, because the 3-mm port did not allow insertion of the pre-tied suture. However, we tackled the problem after applying the extracorporeal suturing via the 3-mm port and eliminated the need for a conversion in the subsequent patients. The other two patients were converted to the conventional TEP approach because of loss of extraperitoneal space in the presence of pneumoperitoneum, or a suboptimal operative field caused by profound bleeding.

Second, the needlescopic instruments were fragile and bent easily around a fixed fulcrum at the point of entry into the abdominal cavity. Also, the small jaws of the instruments with their limited grasping ability hindered ideal retraction of large solid organs or inflamed tissue.

Thus, it was easy to injure the tissue despite careful manipulation. The lightweight polypropylene mesh had the properties of flexibility, durable strength, and large porosity, which allowed strong tissue in-growth, and therefore, it is commonly used in laparoscopic extraperitoneal hernioplasty.[20] Although it is technically more challenging to manipulate the large porous mesh with finer instruments, there was no difficulty encountered in mesh insertion and manipulation in our experience.

Third, because of our working ports and telescope were placed over the midline, there might have been a lack of triangulation during dissection, as in single port surgery. However, no further working port was needed for bilateral inguinal hernia. Also, a 5-mm camera port does not allow mesh insertion, therefore, a smaller telescope can be used in the needlescopic TEP approach. Finally, the needlescopic TEP approach is a technically demanding and challenging procedure. Dissection has to be meticulous to prevent tearing the peritoneum and bleeding. Further improvement of the needlescopic instruments could result in better grasping and haemostasis during the operation. Therefore, the procedures should be performed by experienced laparoscopic surgeons.

In conclusion, needlescopic TEP hernioplasty is a feasible technique in selected patients for inguinal hernia repair. Postoperative recovery after the conventional and needlescopic approaches was similar. However, because this was a small cohort study, larger prospective, randomized controlled trials are required to establish the long-term benefit, safety and complications of needlescopic surgery.

References

1. Kouhia ST, Huttunen R, Silvasti SO, et al. Lichtenstein hernioplasty versus totally extraperitoneal laparoscopic hernioplasty in treatment of recurrent inguinal hernia—a prospective randomized trial. *Ann Surg* 2009;249:384–7.
2. Gholghesaei M, Langeveld HR, Veldkamp R, et al. Costs and quality of life after endoscopic repair of inguinal hernia vs open tension-free repair: a review. *Surg Endosc* 2005;19: 816–21.
3. Lal P, Kajla RK, Chander J, et al. Randomized controlled study of laparoscopic total extraperitoneal versus open Lichtenstein inguinal hernia repair. *Surg Endosc* 2003;17:850–6.
4. Schneider BE, Castillo JM, Villegas L, et al. Laparoscopic totally extraperitoneal versus Lichtenstein herniorrhaphy: cost comparison at teaching hospitals. *Surg Laparosc Endosc Percutan Tech* 2003;13:261–7.
5. Saranga BR, Arora M, Baskaran V. Minimal access surgery of pediatric inguinal hernias: a review. *Surg Endosc* 2008;22:1751–62.
6. Chan KL, Chan HY, Tam PK. Towards a near-zero recurrence rate in laparoscopic inguinal hernia repair for pediatric patients of all ages. *J Pediatr Surg* 2007;42:1993–7.
7. Shalaby R, Desoky A. Needlescopic inguinal hernia repair in children. *Pediatr Surg Int* 2002;18:153–6.
8. Ferzli G, Sayad P, Nabagiez J. Needlescopic extraperitoneal repair of inguinal hernias. *Surg Endosc* 1999;13:822–3.
9. Vara-Thorbeck C, Toscano R, Felices M. Preperitoneal hernioplasty performed with needlescopic instruments (microlaparoscopy). *Surg Laparosc Endosc Percutan Tech* 1999;9:190–3.
10. Lau H, Lee F. A prospective comparative study of needlescopic and conventional endoscopic extraperitoneal inguinal hernioplasty. *Surg Endosc* 2002;16:1737–40.
11. Nyhus LM. Classification of groin hernia: milestones. *Hernia* 2004;8:87–8.
12. Lau H, Patil NG, Yuen WK. Day-case endoscopic totally extraperitoneal inguinal hernioplasty versus open Lichtenstein hernioplasty for unilateral primary inguinal hernia in males: a randomized trial. *Surg Endosc* 2006;20:76–81.
13. Chung RS, Rowland DY. Meta-analyses of randomized controlled trials of laparoscopic vs conventional inguinal hernia repairs. *Surg Endosc* 1999;13:689–94.
14. Collaboration EH. Mesh compared with non-mesh methods of open groin hernia repair: systematic review of randomized controlled trials. *Br J Surg* 2000;87:854–9.
15. Voyles CR, Hamilton BJ, Johnson WD, et al. Meta-analysis of laparoscopic inguinal hernia trials favors open hernia repair with preperitoneal mesh prosthesis. *Am J Surg* 2002;184:6–10.
16. Mamazza J, Schlachta CM, Seshadri PA, Cadeddu MO, Poulin EC. Needlescopic surgery. A logical evolution from conventional laparoscopic surgery. *Surg Endosc* 2001;15:1208–12.
17. Yu SC, Yuan RH, Chen SC, et al. Combined use of mini-laparoscope and conventional laparoscope in laparoscopic cholecystectomy: preservation of minimal invasiveness. *J Laparoendosc Adv Surg Tech A* 1999;9:57–62.
18. Lau H, Lee F. Seroma following endoscopic extraperitoneal inguinal hernioplasty. *Surg Endosc* 2003;17:1773–7.
19. Lau H, Lee F. Lessons learned from ligation of indirect hernia sac: an alternative to reduction during endoscopic extraperitoneal inguinal hernioplasty. *J Laparoendosc Adv Surg Tech A* 2002;12:419–23.
20. Robinson TN, Clarke JH, Schoen J, et al. Major mesh-related complications following hernia repair: events reported to the Food and Drug Administration. *Surg Endosc* 2005;19:1556–60.